such work, added to a telescope of accurate construction and of great power. This explains why it is that it was not seen before 1882. In the ten years that have transpired since that time, it has been seen and described at eight or ten observatories. Nevertheless, some still deny that these phenomena are real, and tax with illusion (or even imposture) those who declare that they have observed it.

Explanations of the Gemination of Canals.

Having regard then to the principle that in the explanation of natural phenomena, it is universally agreed to begin with the simplest suppositions, the first hypotheses on the nature and cause of the geminations have for the most part put in operation only the laws of inorganic nature. Thus the gemination is supposed to be due either to the effects of light in the atmosphere of Mars, or to optical illusions produced by vapours in various manners, or to glacial phenomena of a perpetual winter, to which it is known all the planets will be condemned, or to double cracks in its surface, or to single cracks of which the images are doubled by the effect of smoke issuing in long lines and blown laterally by the wind. The examination of these ingenious suppositions leads us to conclude that none of them seem to correspond entirely with the observed facts, either in whole or in part. Some of these hypotheses would not have been proposed had their authors been able to examine the geminations with their own eyes.

It is far easier to explain the gemination if we are willing to introduce the forces pertaining to organic nature. Here the field of plausible supposition is immense, being capable of making an infinite number of combinations capable of satisfying the appearances even with the smallest and simplest means. Changes of vegetation over a vast area, and the production of animals, also very small, but in enormous multitudes, may well be rendered visible at such a distance. An observer placed in the moon would be able to see such an appearance at the times in which agricultural operations are carried out upon one vast plain—the seed time and the gathering of the harvest. In such a manner also would the flowers of the plants of the great steppes of Europe and Asia be rendered visible at the distance of Mars—by a variety of colouring. A similar system of operations produced in that planet may thus certainly be rendered visible to us. But how difficult for the Lunarians and Areans to be able to imagine the true causes of such changes of appearance, without having first at least some superficial knowledge of terrestrial nature! So also for us, who know so little of the physical state of Mars, and nothing of its organic world, the great liberty of possible supposition renders arbitrary all explanations of this sort, and constitutes the gravest obstacle to the acquisition of well-founded notions. All that we may hope is that with time the uncertainty of the problem will gradually diminish, demonstrating, if not what the geminations are, at least what they cannot be. We may also confide a little in what Galileo called "the courtesy of nature," thanks to which, sometimes from an unexpected source, a ray of light will illuminate an investigation at first believed inaccessible to our speculations, and of which we have a beautiful example in celestial chemistry. Let us therefore hope and study.

EARLY BRITISH RACES.[1]

II.

In continental caves human skeletons of this period have been found; of these, perhaps, the best known is the famous Neanderthal one, from a cave near Düsseldorf. Upon this skeleton alone it would not have been prudent to have based the characters of Palæolithic cave men, because the circumstances under which it was found have given rise to some doubt as to its being of this age, and it is by some considered to belong to the next period which we have to deal with. When it is taken in conjunction with others presenting similar characters, regarding which there is no doubt as to the age to which they belong, the evidence it affords is considerably strengthened. The find of two skeletons at Spey (in Belgium) in 1886, has been most important, both in advancing our knowledge and confirming the characters ascribed to this race from various less complete specimens. The cranium of the Neanderthal skeleton, though very imperfect, is long and proportionately narrow in form, having a cephalic index of 72, the glabella, brow ridges, and external orbital processes are enormously developed, the forehead is remarkably flattened, the occiput is prominent, and the elevation of the whole vault is extremely low. The skulls of both the Spey skeletons are also long and narrow, one having a cephalic index of 70, and the other of 74·6; the superciliary ridges and also the glabella are very prominent; the frontal sinuses are large, the external orbital processes are thick and projecting, the ridges on the frontal, parietal, and temporal bones for muscular attachments are strongly developed; the occiput is prominent with a well-marked "torus" at the junction of the curved muscular ridges, which are also large; the cranial vault is low and flattened from above downwards, and presents an antero-posterior curve very similar to the outline of the side of an ellipse. The malar bones have thick and broad orbital processes, the orbital cavities are deep, and the orbital breadth is but slightly inferior to the width; the zygomatic arches are large. The size of the lower molar teeth increases from before backwards, the first molar being the smallest, and the wisdom or last molar the largest. The lower jaw shows no prominence of the chin; indeed, it recedes somewhat from the alveolar border downwards, and has a symphesial angle of 111°. It is thus a counterpart of the Naulette mandible, which presents similar characters, both as regards the molars and symphesial angle. The stature of the Neanderthal skeleton, estimated from the length of the femur, is 1·604 metres (5 ft. 3 in.), and from the humerus 2 cm. less; that of the Spey skeleton (there being only one of these in which the long bones could be measured), estimated from the femur and tibia, is 1·504 metres (4 ft. 11¼ in.), and from the femur alone, 1·540 metres (5 ft. 0¾ in.). The stature of the Naulette skeleton, that of a woman, estimated from the ulna, is 1·433 metres (4 ft. 4½ in.), and shows that she also was very short.

The long bones of both upper and lower limbs of the Neanderthal skeleton are characterised by their unusual thickness, and the great development of the elevations and depressions for the attachment of muscles, the articular ends of the femur are also of larger size than usual. The femur of the Spey skeleton is more arched forward than usual, it is somewhat flattened from side to side in section, and the articular ends are of large size, especially the lower, in which there is enormous antero-posterior development of the articular surface of the condyles. The tibia is actually and proportionately very short, flattened laterally, and therefore platycnemic. The bones generally are remarkable for their stoutness, and indicate that the muscles attached to them were large and powerful, especially those of the lower limb. In respect to the platycnemism of the tibia, the Spey skeleton corresponds to the Langerie Basse and Madelaine bones from the Perigord Caves, and confirms in a very positive manner the evidence of their surroundings and relicts that Palæolithic people were sons of the chase, as it is connected with the development of the tibialis posticus muscle, and not a race character.

Portions of skulls and skeletons found in various parts of the continent, associated with Palæolithic implements and animal remains of late Pleistocene times, support the peculiar race characters of the specimens just described. The osteological remains of Palæolithic age now in hand from different parts of the continent seem to me to afford sufficient evidence of the existence, both in drift and in cave deposits, of a race of men possessing physical characters quite distinct from those of the Neolithic period, which we will next consider. The assertions which have been made at various times with respect to individual specimens being more or less pathological, will, to my mind, not hold good when we find specimen after specimen from the same deposits showing similar characters. It may not be possible, in some cases, to establish the fact that the specimen cannot have been deposited at a later period in the stratum in which it is found, but a careful examination of each specimen, such, for example, as Prof. Topinard has made of the mandible from Naulette, shows anatomical conditions which, not in one respect but in several, indicate as distinctly as his implements the progress of man's evolution, and preclude the idea of this type being a variety of the Neolithic people. The specimens of Palæolithic man seem to me to show identity of race, whether they have been found in the river-drift or in the Palæolithic stratum of caves. The idea of Prof. Boyd Dawkins, that the implements found in the river-drifts and later Palæolithic deposits of caves, give evidence of there being two Palæolithic races, is not supported by the osteological remains yet to hand. From extensive examination of ancient British skeletons,

---

[1] Continued from p. 70.

I do not consider that there is any evidence of the existence of the direct descendants of Palæolithic man among the osteological remains of Neolithic or subsequent date in Britain. Here he seems to be as extinct as many of his contemporary animals of the late Pleistocene period; this may not be the case with respect to his existence in other parts of Europe. Whether he has still representatives in America, as surmised by Prof. Boyd Dawkins and some American anthropologists, is outside the scope of the present lecture.

The next period at which we find remains of man in Britain is separated from the previous one by a space of time measurable only by the changes occurring in the interval. Great Britain and Ireland had once more become islands almost of the same dimensions as at the present day, with a moister and more continental climate—hotter in summer and colder in winter—abundant forests extending as far as the extreme north of Scotland, and numerous morasses and peat bogs. Not less significant was the advance in civilisation man had made since Palæolithic times, as we now find him dwelling in fixed habitations, with a knowledge of the arts and agriculture, with domestic animals, and with stone implements of a much more developed character, as he had now learned to smooth them by grinding and polishing.

These Neolithic people, as they are called, lived in camps, surrounded by ditches and ramparts, on the tops or sides of hills, or in suitable valleys. The camps were intersected with numerous drains or ditches, which would show that the climate was moist. Inside the camps they hollowed out pits, in or round which they dwelt. Excellent examples of the encampments or villages of the same Neolithic people, but of a much later date, have been discovered and described by General Pitt-Rivers in his excavations near Rushmore, from the main outlines of which some idea may be formed of what their earlier dwelling-places were probably like (Fig. 16). From these camps have been obtained spindle whorls and bone combs toothed at one end, showing that they were acquainted with the arts of spinning and weaving, bone needles, fragments of coarse pottery, made by hand and not turned on the wheel, either plain or ornamented with simple lines or dots, bones of the roe, red deer, dog, goat, short-horned ox, horse, pig, &c., and fish, but no trace of metal is found. Of all their implements the stone axe is perhaps the most important. Flints used for implement-making were now often quarried from below the soil, with antlers of deer as picks. The implements were distributed over districts far removed from where they were made, probably by barter, Jadite or Nephrite implements having been found in Britain, which Mr. Rudler has shown may have been obtained from Switzerland, Silesia, or Styria. They possessed canoes formed out of the trunks of trees, in which they probably reached this country from the continent.

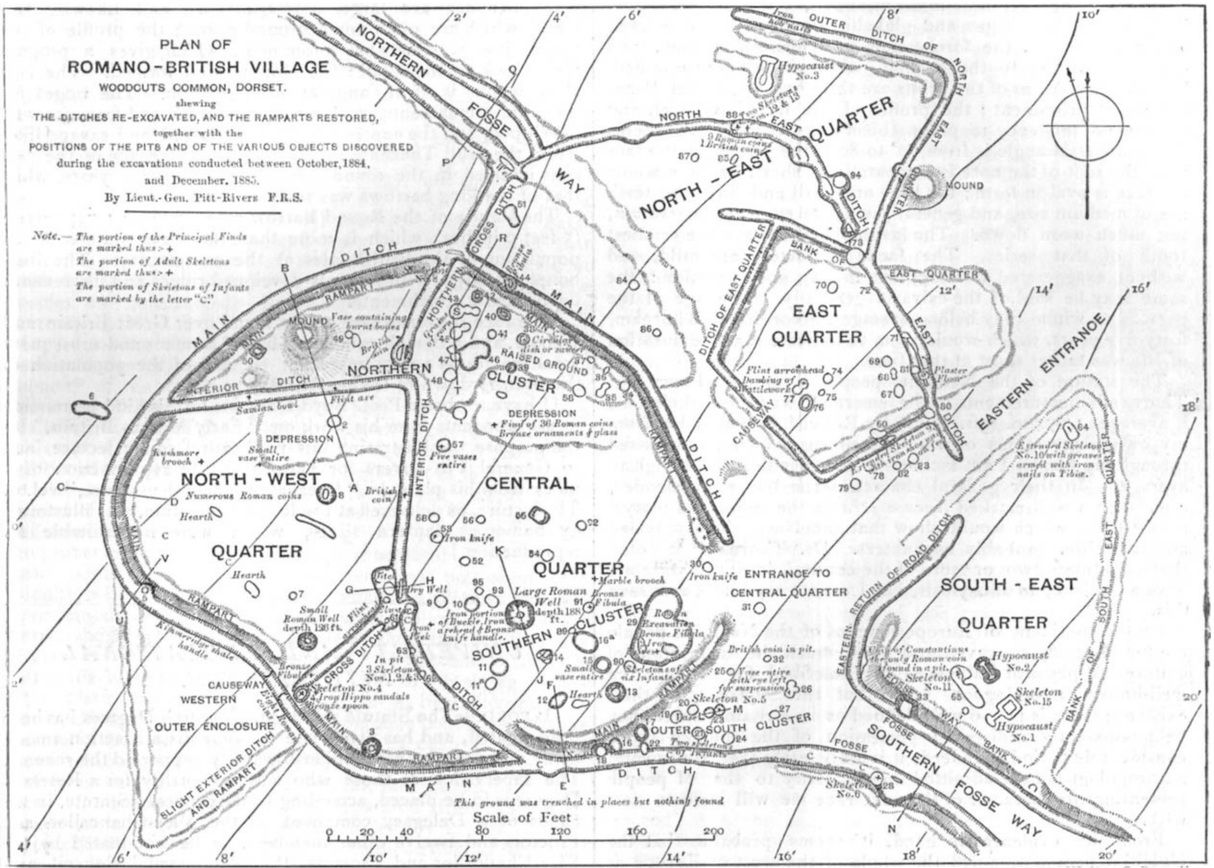
PLAN OF
ROMANO-BRITISH VILLAGE
WOODCUTS COMMON, DORSET.
shewing
THE DITCHES RE-EXCAVATED, AND THE RAMPARTS RESTORED,
together with the
POSITIONS OF THE PITS AND OF THE VARIOUS OBJECTS DISCOVERED
during the excavations conducted between October, 1884,
and December, 1885.
By Lieut.-Gen. Pitt-Rivers F.R.S.
Note.—The portion of the Principal Finds are marked thus:- +
The portion of Adult Skeletons are marked thus:- +
The portion of Skeletons of Infants are marked by the letter "C."
NORTHERN FOSSE WAY
OUTER DITCH OF NORTH EAST QUARTER
NORTH - EAST QUARTER
MOUND
MAIN DITCH
RAMPART
NORTHERN CLUSTER
RAISED GROUND
DEPRESSION
INTERIOR DITCH
NORTH - WEST QUARTER
CENTRAL QUARTER
SOUTHERN CLUSTER
EAST QUARTER
DITCH OF EAST QUARTER
EASTERN ENTRANCE
ENTRANCE TO CENTRAL QUARTER
SOUTH - EAST QUARTER
EASTERN RETURN OF ROAD DITCH
OUTER SOUTH CLUSTER
SOUTHERN FOSSE WAY
CROSS DITCH
CAUSEWAY
WESTERN OUTER ENCLOSURE
SLIGHT EXTERIOR DITCH AND RAMPART
This ground was trenched in places but nothing found
Scale of Feet
0 20 40 80 120 160 200
Walker & Boutall sc.

FIG. 16.

They buried their dead in caves, which had been used a dwellings, in their camps, and in chambered and unchambered barrows. The most characteristic British barrows of this period are of long oval shape, and often of large size, but Neolithic interments are also found in circular barrows. The dead were buried in a contracted or crouched position, and with them, stone and bone implements of various kinds, and pottery, which would seem to show that these articles were intended for the use of the dead or their spirits. Relics of art in the form of carvings are seldom found, and are very inferior to those of late Palæolithic times.

Osteological remains of the Neolithic people are distributed all over Britain, from the south of England to the extreme north of Scotland. They are most numerous in the south-west of England, especially in Wilts and Gloucestershire, the part of the country occupied by the Drobuni, or Silures, at the beginning of the historic period. They have been found in considerable numbers in Yorkshire, Derbyshire, and Stafford. Huxley and Wilson have described the same race from horned cairns in Caithness, and from other places of Scotland. I have described them from Wiltshire, Yorkshire, Middlesex, and from Orkney.

There is some doubt of their having been found yet at an early period in Ireland, as Prof. Macalister informs me that he has not recognised them in Ireland, where there are no long barrows. Sir William Wild, on the other hand, recognised Neolithic skulls from Somersetshire as identical with certain ancient Irish skulls. Any skulls from Ireland I have seen, which have shown characters similar to the Neolithic skulls from England, are of later date, but Huxley describes them from chambered tombs, peat mosses, and river deposits of Ireland. I think we may conclude, as regards Ireland, that although it is doubtful whether the Neolithic people were there at as early a date as in Britain, they were certainly there later.

The characters of the skeletons are well marked. The skull is large and well formed, the calvaria is long and proportionally narrow, having a cephalic index of about 70, and of oval shape. The superciliary ridges and glabella are moderately or even feebly developed, the forehead is well formed, narrow, and curves gracefully to the occiput, which is full and rounded. The upper margins of the orbits are thin, and the malar bones are never prominent; the profile of the face is vertical, and there is no tendency to prognathism; the chin is prominent, the symphesial angle is from 70° to 80°; the length of the face from the root of the nose is comparatively short, but as a whole the face is oval in form; the jaws are small and fine, the teeth are of medium size, and generally in a good state of preservation, not much worn down. The last molar is always the smallest tooth of that series. The facial characters are mild, and without exaggerated development in any one direction; the same may be said of the calvaria generally. The age of the persons to whom they belong averages, according to Thurnam, forty-five years, which would seem to indicate that the duration of life was rather short at that time.

The stature of the Neolithic people is short. From Dr. Thurnam's measurements of the femora of twenty-five skeletons, it averages 1·674 m. (5ft. 6½in.) by Rollet's formula; but from my own observations of other specimens which have passed through my hands, I am inclined to consider this as too high an average. In their general characters the bones are slender, often with a well-marked *linea aspera* on the femur and platycnemic tibia, which would show that the Neolithic people led an active life, probably as hunters. Dr. Thurnam has noted that sometimes two or more of the cervical or dorsal vertebræ have a tendency to anchylosis, but I cannot say I have ever seen this.

On the continent of Europe remains of the Neolithic people are found chiefly in caves, and show much the same state of culture and physical features as just described, for instance the well-known Cro-Magnon race; but the sequence of their existence there is not so well defined as in Britain, where they held apparently undisputed possession of the country for a considerable period. Indeed, it is only lately that continental anthropologists have admitted their priority to that of people presenting the character of the next race we will have to deal with.

From the evidence to hand, it seems probable that the Neolithic people occupied the whole of the west of Europe at one time; and I agree with several observers in considering that they are to be identified with the old Iberian race, of which the Basque may be considered a remnant. There is certainly a strong similarity between Basque skulls and those of the Neolithic people of Britain.

Unlike Palæolithic man the Neolithic people have never become extinct in Britain, and their descendants exist to the present time. It is true that subsequent invaders drove them, in many instances, to particular parts of the country, as early history and the excavations of General Pitt-Rivers and others show; but skeletons from ancient tombs indicate that they also mixed with their conquerors.

The next people to appear upon the scene, previous to the dawn of history, are those who were in possession of the greater part of Britain at the time of the Roman invasion. They came into Britain from France and Belgium at a considerably earlier period, and subjugated or displaced the Neolithic race. These are the so-called Celts. Their advent is marked by the introduction of the use of metals into Britain, and they are associated with the Bronze age. From the custom they had of interring their dead, whom they chiefly cremated, in barrows of a circular shape, they are often known as the Round Barrow people. They show a marked advance in civilisation beyond that of Neolithic times, as they were agriculturists, and lived by tilling the soil; they manufactured weapons and ornaments of bronze, and richly decorated pottery; their flint implements also were of better make, as evidenced by their beautiful barbed arrow-heads. To this period belong many of the curious lake dwellings found all over Great Britain and Ireland, Picts houses of Scotland, and bee-hive houses of Ireland.

Their osteological remains show that the skull was large with strongly-developed superciliary ridges and glabella, the brow well formed and broad, the upper occipital region not projecting, the tuberosity being the most prominent. In general form the brain-case is broader and rounder than in the Neolithic race, the cephalic index centring round 81; they were, therefore, a distinctly brachycephalic people. The upper border of the orbit is thick, the malar bones are prominent and large. The jawbones are large, *macrognathous*, and likewise the teeth, which are often much ground down; the profile of the upper jaw is somewhat prominent, which gives a prognathous look to the skull; the chin is well formed. The face as a whole is of an angular lozenge form. The ridges for muscular attachments, both on the cranium and face, are well developed, and the expression is very rugged and savage-like. From the skull Thurnam estimated the average age of the persons interred in the round barrows was fifty-five years, while that of the long barrows was ten years less.

The stature of the Round Barrow race averages 1·747 metres (5 feet 9 inches), which is more than the mean stature of the population of the British Isles at the present day. The limb bones are large, with strongly-developed ridges and depressions for muscular attachments.

This race is everywhere to be found over Great Britain and Ireland, and although conquered by the Romans and subsequent invaders, forms a very important element of the population of the country down to the present day.

[I have to thank Prof. Boyd Dawkins for his kind permission to use woodcuts from his work on "Early Man in Britain," for the purpose of illustrating this publication of my lecture, and to General Pitt-Rivers for permitting the reproduction of a block from his plate in "Excavations near Rushmore," vol. ii. The lecture, as delivered at the Royal Institution, was illustrated by numerous lantern slides, which were not suitable for reproduction.]

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The Statute relating to Research Degrees has been promulgated, and has given rise to some dissatisfaction among many of those who have hitherto warmly supported the scheme. The supervision of those who wish to qualify for a Research Degree is to be placed, according to the proposed Statute, in the hands of a Delegacy composed of the Vice-Chancellor and Proctors and twelve other members, to be nominated by the Vice-Chancellor and Proctors, the Hebdomadal Council, and the Members of Congregation. This amounts to the creation of a new Delegacy similar in constitution and in powers to the existing Delegacy of non-collegiate students, and it is felt that it is a most unsuitable mode of supervising the work of men none of whom may be less than twenty-one years of age. It was thought that the supervision of the researchers should be vested in the Professorial body, and it is much to be hoped that the proposed Statute will be thrown out in Congregation, for it is nearly certain that no persons qualified for research would submit themselves to the supervision of such a heterogeneous body as the proposed Delegacy, and the scheme, of which so much is expected, would become a dead letter.

In a meeting of the Junior Scientific Club, held on Friday, November 16, Mr. P. Elford, of St. John's, exhibited a specimen of shale oil, and papers were read by Mr. F. Druce, of Magdalen College, on anticyclones and other types of atmospheric pressure, and by Mr. W. W. Fisher, of Corpus Christi College, on the Oxford water supply.

Mr. P. L. Sclater, F.R.S., has been elected an honorary Fellow of Corpus Christi College.